Numerical studies of plasmoids during the nonlinear evolution of double tearing modes in slab and cylindrical geometry

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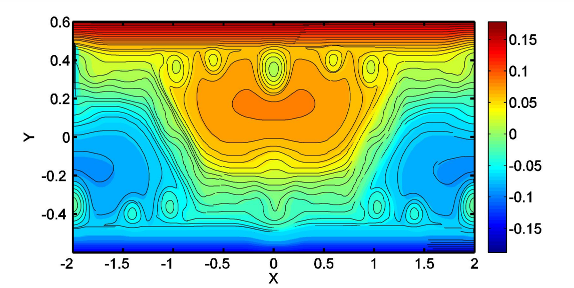
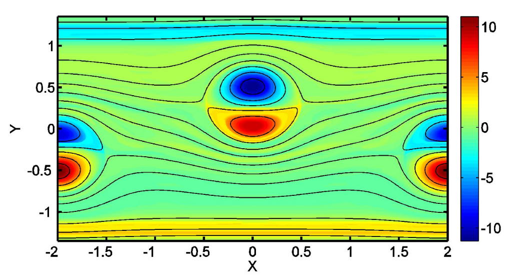
Double tearing mode (DTM) is an important kind of magnetohydrodynamics (MHD) instability that often occurs with reversed central magnetic shear configuration in tokamak discharges. A nonlinear MHD code based on a conservative perturbed MHD model by splitting primary variables in original MHD equations into equilibrium part and perturbed part has been developed. The nonlinear evolution of double tearing mode in slab and cylindrical geometry is numerically investigated in high Lundquist number regime. The onset of the secondary and tertiary islands (plasmoids) due to the tearing unstable current sheets formed during the fast reconnection phase and a new nonlinear evolution process characterized by two fast reconnection phase are investigated and discovered. More effects, including the flow, guiding field, viscosity etc. are under way. In cylindrical geometry plasmoid generations different from slab geometry during the nonlinear DTM evolution are observed. The details will be presented.



(a)



(b)

Plasmoids during the nonlinear evolution of DTM in high Lundquist number regime:(a) Multiple (five) secondary islands formation in nonlinear evolution of double tearing mode with equilibrium current sheets distance y0=0.2,(b)A typical picture of a new quasi-stationary characterized as two pairs of coexisting islands with well preserved symmetry.

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